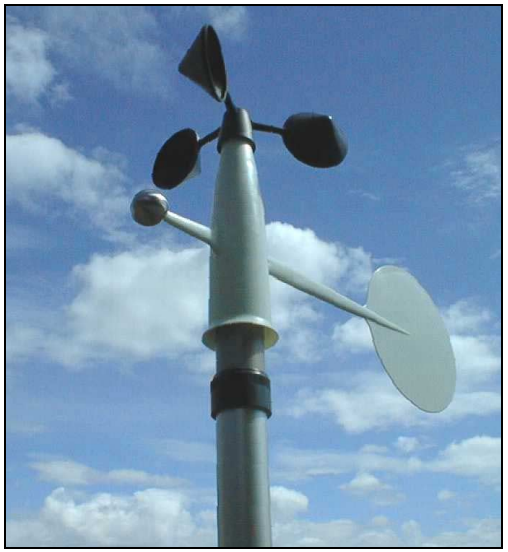
VAISALA

Quick Reference Guide

Combined Wind Sensors WMS301 & WMS302



- **Combined wind speed & direction measurements**
- **Suitable for low power applications**
- **Fast response**
- **Excellent linearity**

DESCRIPTION

WMS301 and WMS302 are compact sized wind sensors with the wind speed and direction sensors integrated into one unit. The sensor electronics is located inside a watertight compartment providing full protection against water, dust, pollutants, and electromagnetic interference.

The cup wheel shape, dimensions, and material have been carefully designed to achieve maximum quality of measurement. The conical cups have been tested to give linear response between wind speed and angular velocity of the cup wheel. The polyamide plastic reinforced with carbon fiber guarantees a rigid structure even at the highest wind speeds.

The anemometer ball bearing assembly is composed of a wheel shaft, a pair of low friction ball bearings, and a shaft fixed magnet. A reed relay with electronics located in the body of the sensor converts the cup wheel rotation to pulses. Therefore, when properly supplied the sensor can be read practically with any data logger, either by counting the number of pulses within a fixed time period or measuring the time between successive transients. Averaging of transient intervals should be used, since two pulses with non-symmetric positioning are generated during one revolution.

The balanced wind vane is integrated in the housing, underneath the cup wheel. The circular tail is located far enough from the body and the cup wheel to avoid turbulences due to these structures. The vane assembly is of PA reinforced with glass fiber providing durable and lightweight structure with fast response and low inertia.

The angular position of the vane is detected using an axial symmetric rotating potentiometer. The potentiometer features low starting and running torque, linear arc-to-resistance transfer ratio, and long operation life.

WMS301 is equipped with a one-wiper-type potentiometer with an open cap of only 5 degrees. With constant voltage applied to the potentiometer, the output voltage is directly proportional to the azimuth angle. WMS302 has a two-wiper-type potentiometer to overcome the cap discontinuity. However, a more complex voltage-to-direction conversion process is needed.

INITIAL CHECK

After having unpacked the sensor, please check for any signs of shipping damage. Test that the vane and cup wheel rotate without friction. Before installation, use an ohmmeter to check the proper operation of SPEED output and DIR output(s) while rotating the cup wheel/vane slowly. 10 kΩ/360º and 10 kΩ/180° potentiometers are used with WMS301 and WMS302, respectively. Refer to Figure 4.

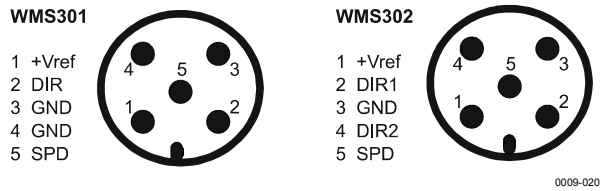


Figure 1 Connectors of WMS301 and WMS302

INSTALLATION

After a proper place for wind measurement has been selected, the WMS301 sensor can be mounted to the mast as follows:

1. Fit the cable through the mounting piece and connect the cable to the sensor.
2. Fasten the mounting piece to the sensor with the plastic collar.
3. Place the sensor onto the mast.
4. Connect the ohmmeter between +Vref and the DIR pin (WMS301) or between +Vref and DIR1 pin (WMS302).
5. Keep the vane pointed to the north and turn the base until resistance reaches its minimum value. Fasten the mounting screw.

After initial installation, the sensor can be removed and remounted to its place with the plastic collar without realigning, except after potentiometer replacement.

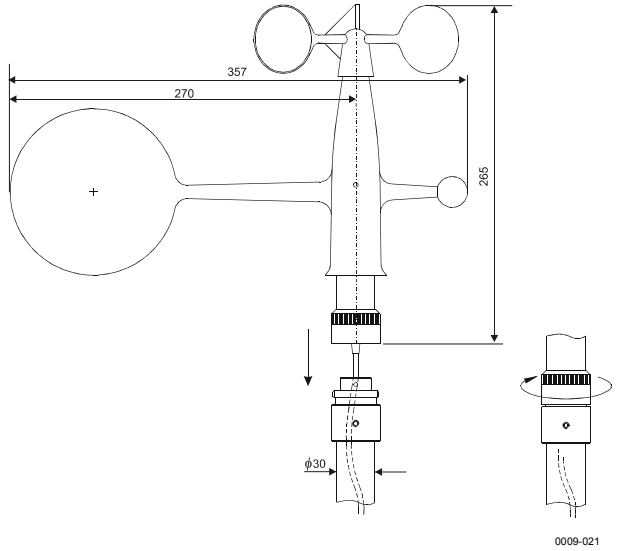


Figure 2 Mounting of WMS Sensors to the Mast

TECHNICAL DATA

Anemometer

Property		Description / Value
Sensor / Transducer type		Dual Reed switch
Measuring range		0.5 ... 60 m/s
Starting threshold		< 0.4 m/s
Distance constant		2 m
Transducer output		1 Hz ~ 0.7 m/s
Accuracy	(≤ 10 m/s)	± 0.3 m/s
	(> 10 m/s)	error < 2 %
Transfer function, where U = wind speed [m/s] F = output frequency [Hz]		U = - 0.24 + F × 0.699

Vane

Sensor / Transducer type		Potentiometer
Measuring range	WMS302	0 ... 360°
	WMS301	0 ... 355°
Starting threshold		< 1.0 m/s
Damping ratio		0.3
Overshoot Ratio		0.4
Delay Distance		0.6 m
Accuracy		better than ± 3°
Transducer output	WMS302	V_{ref}/180 ~ 1°
	WMS301	V_{ref}/360 = 1°

Common

Supply voltage	3 ... 15 VDC
Electrical connections	5-pin male with 12 mm threads
Operating temperature	- 40 ... + 55 °C
Storage temperature	- 60 ... + 65 °C
Dimensions	265 (h) × 360 (w) mm
Weight	360 g
Body material	AlMgSi, gray anodized
Cup material	PA, reinforced with carbon fiber; black
Vane material	PA, reinforced with glass fiber, white

Spare Parts

Spare Part	Order Code
Cup wheel assembly	WA45233
Anemometer bearing assembly	WA45232
Vane assembly	WA35234
Set of bearings	25160WA

MAINTENANCE

It is recommended to check the ball bearings of the anemometer and the vane every year. If the cup wheel or the vane is not rotating smoothly or creates detectable noise, the bearings must be replaced (refer to Figure 3).

Anemometer bearings:

1. Loosen the hubnut (14) with fingers or a 10 mm tool and remove the cup wheel (13).
2. Remove the ball bearing assembly (12) by unscrewing it counterclockwise (with a 10 mm tool).
3. Insert a new bearing assembly (12). Tighten gently.
4. Fasten the cup wheel to the sensor. Tighten gently.

Vane bearings:

1. Proceed as described in steps 1 and 2 above.
2. Open the lock screw (11) of the assembly (10) and remove the screw.
3. Remove the Seeger-ring (9) (with narrow point pliers).
4. Remove the bearing assembly (8).
5. Replace the bearings inside the housing with new ones.
6. Assemble the sensor in the reverse work order.

Due to normal wear, it may become necessary to renew the direction potentiometer or the anemometer electronics assembly.

1. Remove the sensor housing parts as described in steps 1 to 6 above.
2. Open the body (1 + 6) by unscrewing it clockwise.

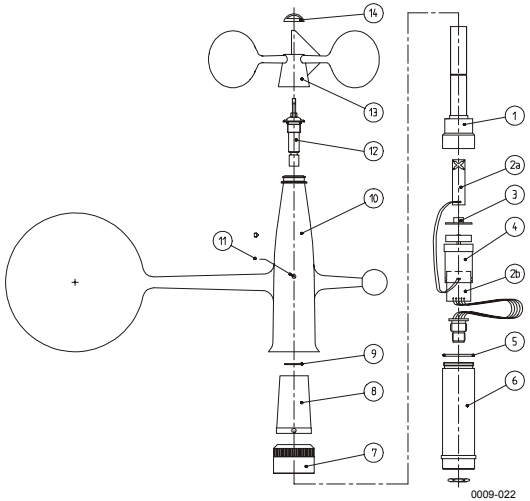


Figure 3 WMS Sensor Assembly

3. To replace the potentiometer, proceed as follows:
   - 3-1. Pull the potentiometer PCB (2b) out from the sleeve (4).
   - 3-2. Unsolder the potentiometer wires from the PCB.
   - 3-3. Solder new potentiometer wires to the PCB.
   - 3-4. Push the PCB (2b) into the plastic sleeve (4) by pressing the sleeve sides. Note the guide holes.
4. To replace the reed-switch PCB, proceed as follows:
   - 4-1. Pull out the retainer (3) and the reed-switch PCB (2b).
   - 4-2. Unsolder the old wires and solder new ones for the PCB.
   - 4-3. Push the PCB into the tube of the casing (1).
   - 4-4. Fit the flat wire to the groove at the casing wall and insert the retainer. Make sure that the flat wire is tightly against the casing wall.
5. Insert the potentiometer assembly into the upper part tubing.
6. Screw the body parts (1) and (6) together. Tighten carefully.
7. Ensure the mast adapter sleeve (7) is on the base part (6).
8. Place the bearing housing (8) to the casing and secure with a Seeger-ring (9).
9. Place the vane assembly (10) onto the body. The lock screw hollow at the casing must be seen through the lock screw hole of the vane body.
10. Fasten the assembly with a lock screw (11). Tighten gently.
11. Screw the bearing housing (12) into the casing (1). Tighten gently.
12. Fasten the cup wheel to the sensor shaft.

A pull up resistor (10 kΩ, e.g.) is needed at SPD output to supply the anemometer electronics. It is recommended to use a Schmitt-trigger input with the SPD signal.

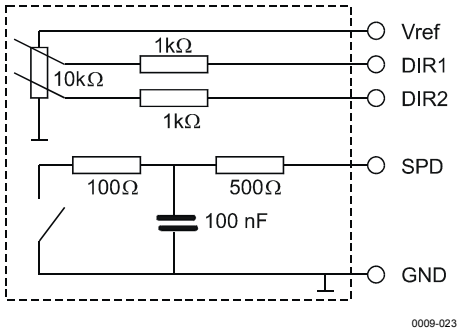


Figure 4 WMS302 Principal Circuit Diagram (DIR2 Is Not in Use with WMS301)